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AN IMPROVED PROCESS FOR THE PREPARATION OF CELLULOSIC MATERIAL HAVING PROPERTIES SIMILAR TO THAT OF THROMBOGENIC ADSORBABLE COLLAGEN.

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THUNUGUNTLA JAI MANGAL SINHA AND PADMA VASUDEVAN BOTH INDIAN nationals of Indian Institute of Technology, Hauz Khas, New Delhi - 110016, India.

The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed :-

PRICE : TWO RUPEES

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This invention relates to an improved process for the preparation of cellulosic material such as cellulose ^{or} viscose ~~or wool~~ having properties similar to that of thrombogenic adsorbable collagen available from animal source.

It is known that blood loss during surgery or an accident can cause irreversible damage to a patient. To prevent such an irreversible damage, it is known to apply local thrombogenicity by physical or chemical means, which consists in, for example, the application of pressure, padding with absorbent cotton, mechanical clamping of the oozing blood vessels or applying high positive charge electrodes at the site of bleeding. Most of such processes depend on the normal clotting mechanism for sealing the wound.

Several factors have been identified which initiate or activate clotting of the blood at the local site. In the normal process of blood coagulation when a blood vessel is ruptured, collagen comes in contact with the blood. Certain conformational changes in collagen result in specific adsorption of platelets from the blood leading to platelet aggregation and release of ADP which in turn initiates

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the intrinsic blood clotting mechanism and formation of fibrin network.

Thrombogenic absorbable collagen is now available as a blood clotting agent. However, several distinct disadvantages are associated therewith. As such an absorbable collagen is available from animal, the extraction and purification steps are time consuming and costly.

In order to obviate such a disadvantage, a process is known in the art for treating cellulosic material so as to impart thromogenic properties thereto. Such a process consists in oxidizing cellulose with nitrogen oxide so as to produce oxidized cellulose having thrombogenic properties. In the known process, nitrogen oxide reacts with primary or 6 hydroxyl group of cellulose to form a nitrous compound. The water present hydrolyzes the nitrous ester to form a carboxyl group. Such an oxidation of cellulose by nitrogen oxide is shown in Fig. 1 of the accompanying drawings. The disadvantage associated with such a known process is that only a limited number of groups are converted into carboxyl groups.

Accordingly, a primary object of this invention is to propose an improved process for the preparation

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of cellulosic material having properties similar to that of thrombogenic adsorbable collagen available from animal source.

Another object of this invention is to propose a process for the preparation of oxidized cellulosic material having biosoluble properties.

Yet another object of this invention is to propose a process for the preparation of oxidized cellulosic material having improved bio-adsorbability properties.

Still another object of this invention is to propose for the preparation of oxidized cellulosic material having a higher degree of oxidation in that large number of hydroxy groups are oxidized.

A further object of this invention is to propose a process for the preparation of oxidized cellulosic material having better ~~belts~~ strength.

A still further object of this invention is to propose for the preparation of oxidized cellulosic material having an antimicrobial property.

Yet a further object of this invention is to propose a process for the preparation of oxidized cellulosic material having spermicidal properties.

Further objects and advantages of this invention will be more apparent from the ensuing description.

According to this invention there is provided an improved process for the preparation of cellulosic

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material such as cellulose) viscose or wool having properties similar to that of thrombogenic adsorbable collagen available from animal source by oxidation of cellulosic material characterized in that prior to oxidation with nitrogen oxide, the hydroxyl groups of said cellulosic material at 2 and 3 positions are subjected to oxidation with meta periodate or periodic acid to obtain 2, 3, - dialdehyde cellulose, which is then oxidised with a nitrogen oxide in a vapour phase at a normal pressure.

The materials treated by the process of the present invention consist of cellulose^{and}, viscose, and wool. This, reference hereinafter made to cellulose is intended to imply and include viscose and wool. However, viscose is a preferred material as it possesses a narrow molecular weight distribution.

The process comprises in a first step of treatment of cellulosic material with periodic acid or a metal periodate. It would be apparent that potassium meta periodate could alternatively be employed except that the costs would substantially increase. A ^{aqueous} solution of periodic acid or meta periodate the reactant is prepared such that the concentration is between 0.1 to 0.4 molar concentration and which provides an oxidation of 30 to 60%. It has now been found that a greater degree of oxidation results in higher bio-absorbability properties of the cellulose. A high

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bioabsorbability property of the cellulose is a desired feature, which can be achieved by a higher degree of oxidation. Simultaneously, it has now been found.....

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that though a higher degree of oxidation does improve the bioabsorbability property of the cellulose, a distinct disadvantage associated therewith is the loss in mechanical strength of the cellulose. Accordingly, a degree of oxidation of higher than 60% would detrimentally affect the mechanical strength of the cellulose. Simultaneously, a degree of oxidation of less than 30% would result in a decrease in the number of carboxyl groups present in the oxidized cellulose.

Reference is made hereinabove to the degree of oxidation. It is to be understood that such a step of oxidation is effected whereby the hydroxyl groups at 2 and 3 positions are oxidized into 2,3 dialdehyde cellulose and in a manner as shown in Fig.2 of the drawings.

Such a step of oxidation is carried for a period of 4 to 24 hours. It would be apparent that the factors controlling the period of oxidation are, firstly, the nature of the material and, secondly, the concentration of the reactant. Accordingly, greater the concentration of the reactant, lesser is the time period for the oxidation. However, the concentration of the reactant cannot be increased substantially, as this would then result in an uneven oxidation. Thus,

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and by way of example, if the concentration of the reactant is increased to 0.6 molar concentration, then a surface oxidation may only take place, consequently, resulting in a non uniform oxidation.

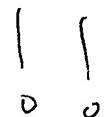
As will be apparent, the first step of oxidation does not result in the formation of a carboxyl group, and, whereby, the treated cellulose does not possess any thromogenic property. In order to impart such thromogenic properties, the treated cellulose is subjected to a second step of oxidation for converting 2, 3-dialdehyde cellulose and the primary or 6 position hydroxyl group present in the cellulose into carboxyl groups as shown in Fig. 3. It would be apparent that such a process provides a greater number of carboxyl groups which have thrombogenic property in the treated cellulosic material and therefore the obtained cellulosic material has improved thromogenic properties in comparison to that ones known in the art.

The cellulosic material so obtained may, thereafter, be treated with a calcium salt.

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they are claiming
that PARC is
not thrombogenic



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ONE SHEET

NAME: THUNUGUNTLA JAI, MANGAL SINGH &
PADMA VASUDEVAN

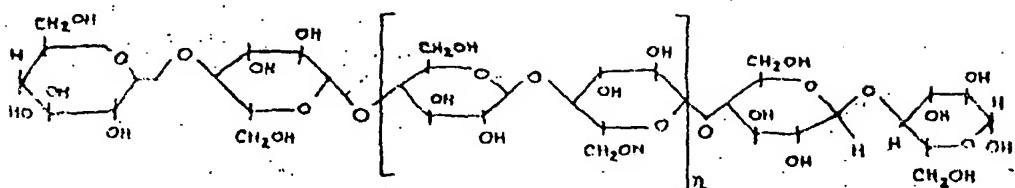


Fig 1
Chemical formula

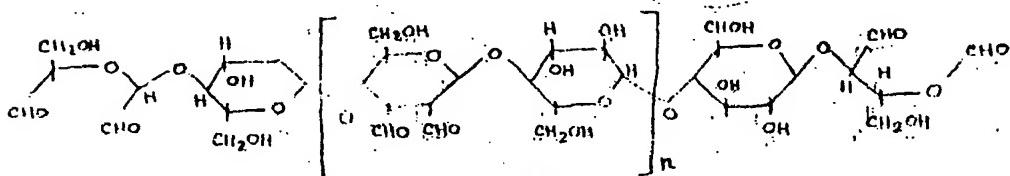


Fig 2

↓ Nitrogenic acid

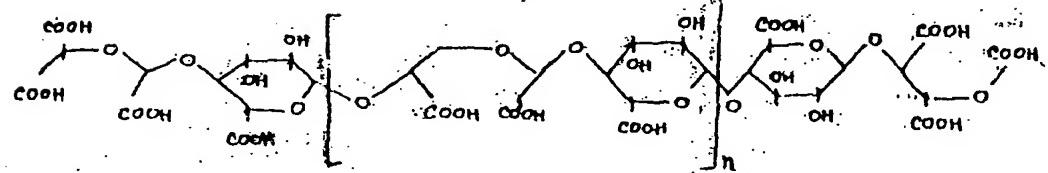
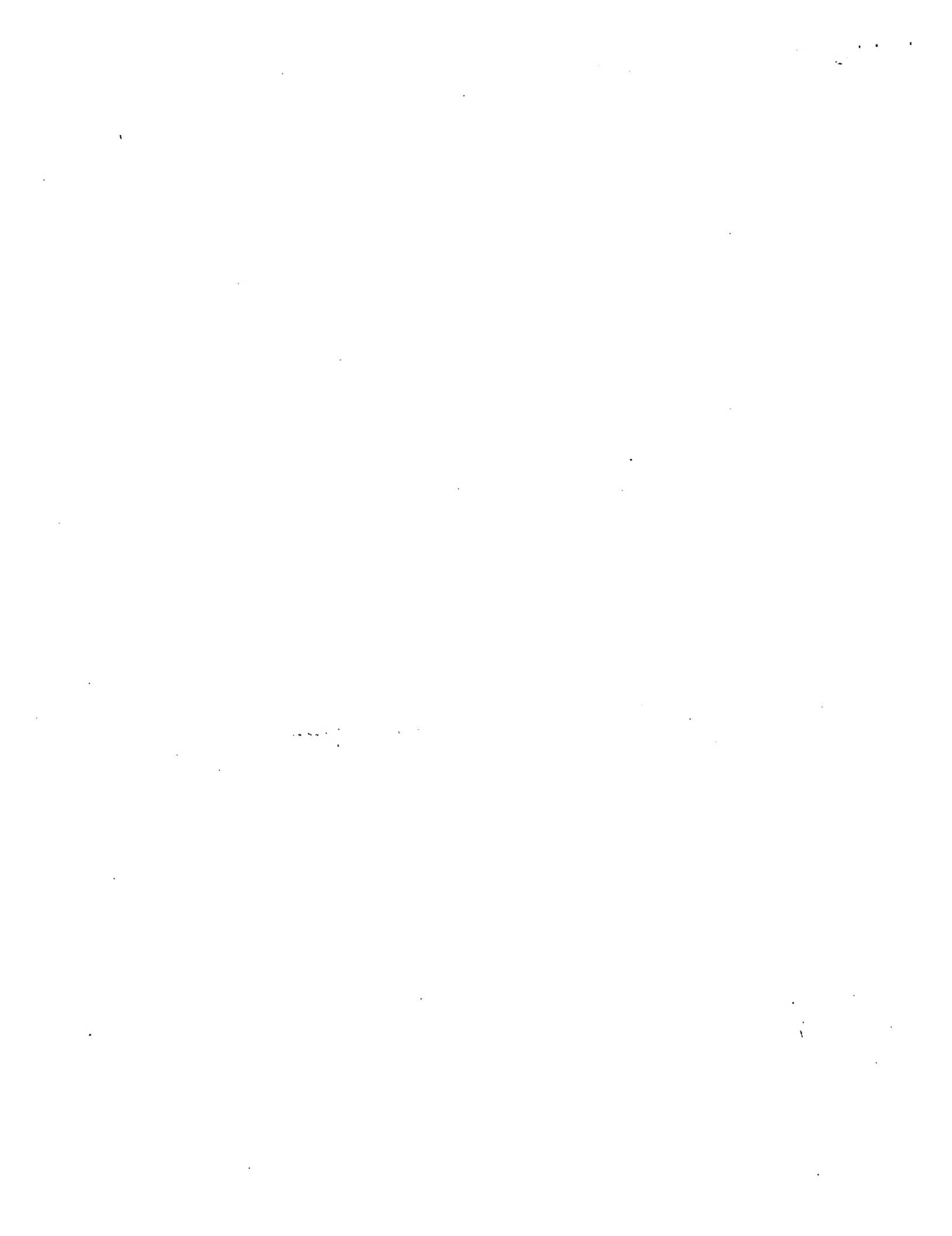


Fig 3

Ullalirao
(L. S. DAVAR)

OF L. S. DAVAR & CO.
APPLICANTS' ATTORNEY



WE CLAIM:

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1. An improved process for the preparation of cellulosic material such as cellulose/viscose or wood having properties similiar to that of thrombogenic adsorbable collagen available from animal source by oxidation of cellulosic material characterized in that prior to oxidation with nitrogen oxide, the hydroxyl groups of said cellulosic material at 2 and 3 positions are subjected to oxidation with meta periodate or periodic acid to obtain 2, 3-dialdehyde cellulose, which is then oxidised with a nitrogen oxide in a vapour phase at a normal pressure.
2. A process as claimed in claim 1 wherein the concentration of periodic acid or meta periodate used is an aqueous solution having between 0.1 to 0.4 molar concentration and which provides an oxidation of 30 to 60%.
3. A process as claimed in claim 1 or 2 wherein said meta periodate is selected from sodium meta periodate or potassium meta periodate.
4. A process as claimed in any one of claims 1 to 3 wherein the oxidation is carried out for a period of 4 to 24 hours.

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An improved process for the preparation of thrombogenic cellulose material polymers substantially as herein described and illustrated.

Dated this 28th day of JANUARY, 1983.

[Signature]

M. S. DASWANI

of L. S. DAVAR & CO.,
Applicants' Agent

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